Regional Forester Terrestrial Sensitive Species

This section describes the monitoring of 19 terrestrial animals that are listed as Regional Forester Sensitive Species for the Superior National Forest. It does not include sensitive aquatic or plant species. Regional Forester Sensitive Species (RFSS) are only one component of wildlife species that the Forest monitors and manages. Other related wildlife subsections include management indicator species (bald eagle and northern goshawk) and threatened and endangered species (Canada lynx and gray wolf). Important related subsections that correlate to this terrestrial sensitive species section are management indicator habitats and vegetation. This section consists of three subsections; Populations, Habitats, and Emerging Issues/Climate Change.

Subsection 1. Populations

Monitoring Question

Sensitive species monitoring addresses the monitoring question from Forest Plan Chapter 4 of the Forest Plan:

> To what extent is Forest management contributing to the conservation of sensitive species and moving toward short- term (10-20 years) and long-term (100 years) objectives for their habitat conditions?

This subsection will address the portion: "To what extent is Forest management contributing to the conservation of sensitive species?"

Monitoring can also address plan implementation effectiveness with the following question: How effective are we at minimizing negative impacts to sensitive species?

Figure 9b.1. Heather vole, a RFSS on the Superior National Forest.

Monitoring is driven by desired conditions for terrestrial wildlife as described in the Forest Plan direction (D-WL-1-9, pages 2-27 through 2-28). These desired conditions describe how the Forest should look and function if the Plan is successfully implemented. Another monitoring driver is validation of assumptions and predictions of the Forest Plan Final EIS. Monitoring also offers a way to track our cooperative efforts with other agencies and researchers to jointly increase the understanding of sensitive species' habitat needs and

population dynamics. Climate change is an emerging issue with new scientific information and is reviewed for risk to current sensitive species populations.
More specific Forest Plan direction is contained in objectives, standards, and guidelines. Objectives: O-WL-19 through O-WL 27 applies to known sites and maintenance, protection, and/or enhancement of individual sensitive species' habitat, especially breeding habitat. These objectives are listed in the analysis for each relevant species.

Guidelines: G-WL-11 states, "Avoid or minimize negative impacts to known occurrences of sensitive species." G-WL-12 states, "Minimize negative impacts to known sensitive species from management activities that may disturb pairs in their breeding habitat during critical breeding season (varies by species)." Meeting G-WL-11 and -12 will involve diverse management approaches that depend on species' habitat requirements and distribution, individual site conditions, and expected management impacts. These include two basic and complementary strategies: **a.** Landscape level or coarse filter management strategies may allow negative modifications of some portions of sensitive species habitat as long as overall objectives for habitat amount, quality, and distributions are generally met. **b.** Site level or fine filter management strategies may warrant protections of known individual sensitive species locations or high quality potential habitat.

Standards: S-WL-5 states, "If negative impacts to sensitive species cannot be avoided, management activities must not result in a loss of species viability forest-wide or create significant trends toward federal listing."

The Forest Plan provides direction to ensure that we maintain the viability of all native and desired non-native species. For species designated as RFSS we have an added responsibility to ensure that our management activities do not result in a significant trend towards federal listing (FSM 2670.22). Forest Service policy (FSM 2671.1-2672.43) requires evaluation of impacts to RFSS from management activities.

The intent of the monitoring question with regard to populations is to determine if our management is meeting Forest Plan Objective O-WL-1: Populations: Provide ecological conditions to sustain viable populations of native and desired non-native species and to achieve objectives for management indicator species and management indicator habitats.

The monitoring question is appropriate for sensitive species because most of our sensitive species are rare, have limited distribution, have declining or unknown population trends and occur in habitats that are commonly affected by our management. Monitoring allows us to evaluate whether we are contributing to the conservation of sensitive species, helps the Forest learn of management actions that may affect species and adapt those actions to maintain viability of populations, and determine if we are meeting or moving toward the desired conditions of diverse, healthy, productive and resilient wildlife habitats for sensitive species. It also gives us a chance to reevaluate species population trends and risks considering the latest scientific information.

The units of measure selected were; 1) Population trends and 2) Number of known sites for any species. Population trends are a good unit of measure because they reflect changes on a scale larger than, but inclusive of, the Superior National Forest and warn us of viability

concerns. Viable populations, as defined by the Land and Resource Management Plan D-WL-3 b, are those with the estimated numbers and distributions of reproductive individuals to insure their continued existence is well distributed within their range in the planning area.

The number of known sites is a good indicator because it allows us to determine whether our standard operating procedures, such as avoidance and buffering of known locations, are providing the protection we desire for sensitive species near managed areas. This unit is effective and appropriate because it provides information on species' distribution and tracks breeding activity at known occurrences of sensitive species.

Population trends compare the latest species population levels to historical levels. Trend data varies by species and area depending on historical concerns and data collection and is discussed in the Methods section. The number of known sites is compared to the number known in 2004.

Methods and Results for Monitoring of Species Groups

Individual species accounts show the key methods of monitoring for each terrestrial RFSS. For some species monitoring is done by multiple methods. For example, boreal owl breeding territory and productivity monitoring is tracked in three ways: 1) boreal owl nest sites, when located, are monitored to detect nesting success, 2) DNR Biotics database tracks documented nest sites within SNF, and 3) boreal owl nest box project monitors boxes for activity and productivity. The data set that incorporates results for all three of these methods is the data used in this report. More detailed information on monitoring protocols and results are available in M&E Report Project File

The three primary indicators used to monitor terrestrial animal RFSS populations are: 1) population trend; 2) presence/no detection and 3) site occupancy and breeding productivity. Surveys, monitoring, and long-term population studies aimed at single or multiple species aid us in providing population trends and at times, population levels for species ranging in abundance from common to rare. This data helps us monitor not only current sensitive species but species that may become a concern because of declining population trends or habitat loss. In addition, monitoring these species also provides us with a range of options concerning the biogeography and ecology of each organism.

Monitoring more than one species with the same protocol and effort increases data efficiency and reduces costs. Many more partners are able to share multi-species data and sometimes collect the data together, offering increased opportunities to communicate and share ideas across agencies and organizations. The scale of the data collection area, whether local or nation-wide, provides a richer look at the distribution of the target organisms over time and space than would be afforded by using only single species monitoring.

Figure 9.b2. Biologists band and measure a blue jay caught at the Monitoring Avian Populations and Survivorship (MAPS) station near Isabella. The band number, age, sex, and weight are among the data recorded.

1)Population trend. This involves multiple years of surveying a large enough number of individuals ("sample size") to allow an accurate estimate of population trend (direction and magnitude of population change over time) and/or population trajectory (the size of the population over time). Because it is not possible to count every individual of a species, we do not know true population size but rely on monitoring data to provide an "index" or indicator of population. The location of this monitoring is usually Forest-wide or larger geographic area and not tied to project areas only.

2)Presence/No Detection. Detection surveys contribute to the number of known sites for any species and its habitat use. Most RFSS population monitoring is prohibitively expensive because the species' rarity makes it impractical to track enough individuals. So we rely on monitoring methods that detect presence and no presence, as well as distribution. For most of the large landscape scale (10,000s of acres) vegetation management projects, surveys are conducted to detect whether species are present during the breeding season, even though the absence of a detection is not a certainty that the species does not occur there. Because of timing of the survey, rarity of the species, weather or some other factor, we may miss detection of individuals in suitable habitat. The purpose of surveying is to attempt to improve our understanding of habitat associations by surveying across projects in potential habitat and over time (years). Another purpose of these types of surveys is to discover new sites that would require protection from potentially harmful management activities. In addition to conducting new surveys, we return to known breeding sites (occurrences) to monitor whether the species is continuing to use the area.

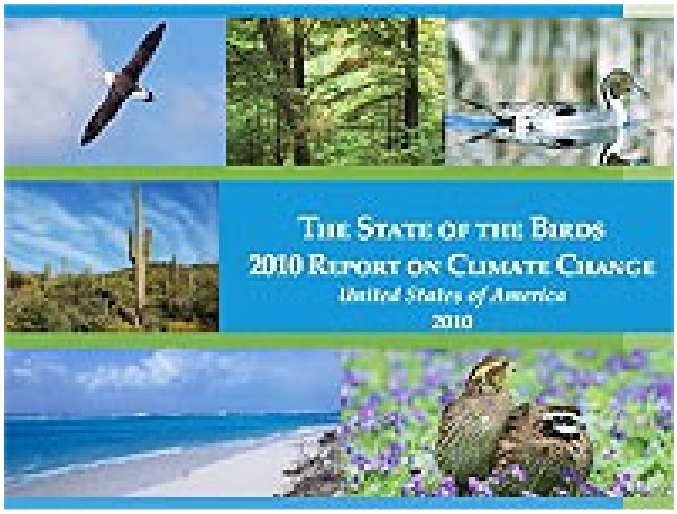
Project-specific monitoring was conducted in the 16 large landscape scale (10,000s of acres) vegetation management projects for which decisions to implement have been made between July 2004 and the end of 2009. Annual survey routes for specific species or suites of species sometimes overlap with project areas and are used for that analysis. Known locations of sensitive species are checked prior to analysis to monitor the species and either avoid or mitigate effects. Occurrences of sensitive species discovered during project

monitoring are incorporated into the appropriate tracking database for each particular species located and will be included in this report through those methods.

3)Site occupancy and breeding productivity: For a few species whose breeding territories or nest or denning sites have been located, we also conduct nest or den site occupancy and breeding success surveys. The results of these surveys also contribute to understanding population dynamics, management impacts, and can add to information used to develop indices of population.

Known sites of sensitive species from 1960 to 2004 are compared to the number of occurrences in 2009. The species accounts list known occurrences of RFSS tracked by Minnesota Department of Natural Resources Biotics Database (MN DNR 2009). RFSS terrestrial animals *not* tracked in the Biotics Database are: gray wolf, sharp-tailed grouse, bay-breasted warbler, Le Conte's sparrow, olive-sided flycatcher, Connecticut warbler, three-toed woodpecker, red-disced alpine, and jutta arctic. Additionally, only nests, not all sightings, are documented for great gray owl, bald eagle, boreal owl, northern goshawk, and peregrine falcons. Only significant population trend data is listed for survey results for the Breeding Bird Survey (BBS). Lack of a significant trend usually means there were data deficiencies for that species and does not reflect a stable population. All BBS data should be reviewed for deficiency factors listed in the results of the survey available on-line.

Figure 9.b3. The State of the Birds Report (NABCI 2010).



Multi-agency/organization monitoring accounts for much of the data used to track known locations and population trends of sensitive species. Superior National Forest biologists participate in and review the findings of many cooperative monitoring programs-listed below. The data from these programs are reviewed to monitor sensitive species' populations during project analysis and monitoring report analysis. Not all data is updated annually, so the most up-to-date information is used. Monitoring or research protocols are available at the respective web sites.

Forest Service biologists are participating in the 2009-2013 Minnesota Breeding Bird Atlas Project, www.mnbba.org/, in survey blocks prioritized by the Atlas and often including

federal lands. This project records all birds showing evidence of breeding behavior in survey blocks and is aimed at determining the distribution of all bird species breeding in Minnesota. Data will be available after the close of the project.

Specific projects used to measure populations of sensitive species are described below with most accounts taken from the Forest Service's 2009 Wildlife Fish and Rare Plants (WFRP) Report which can be reviewed in the M&E Report Project File. General results are included here and specific trend or site data was used to evaluate individual species in the species' sections of this report.

Long-term Small Mammal Monitoring

*Tofte Ranger District (2009 WFRP Report).*This long-term (since 1983) monitoring program tracks the dynamics of small mammal communities on the Superior NF. The purpose is to understand species ecology, population trends, and dynamics, and detect potential effects to small mammal species populations from land management practices. Small mammal species are important to a variety of predators including species such as boreal owl, northern goshawk, great gray owl, fisher, American marten, and others.

An annual report is produced providing information on population trends, species numbers, numbers per trap, capture locations of select species, and a shapefile with trap-line locations. Information can be used to evaluate impacts of land management practices on the National Forest. Data can also be used with other research and monitoring of predator species (i.e. boreal owl and others) to provide basic ecological and biological information on interspecies community dynamics.

Fall Migratory Bird Monitoring Project

Gunflint and Tofte Ranger Districts (2010 WFRP Report). The objective is to determine the depth, location, timing, and intensity of fall bird migration along the North Shore of Lake Superior. In particular, this will be immediately useful in assessing the placement of wind turbines being proposed along the North Shore. This study is in conjunction with a Master's and Doctorate project being conducted through the Natural Resources Research Institute in Duluth, MN. The surveyors have located a series of transects to assess migration on the shore. They are within 1 mile of the shore; 1-3 miles inland from the shore; and 3-8 miles inland from the shore. They occur at intervals between the Canadian Border and Duluth, MN. An observer covers each transect at one interval during the same eight hour period. 2009 was the second year of the study. No definitive results have been discussed. Anecdotally, there appear to be distinct avenues of passage and many species move together.

Forest Songbird Long-Term Monitoring Partnership

All Districts (2009 WFRP Report). Monitoring in 2009 represented the 19th year of a partnership with the University of Minnesota-Duluth's Natural Resources Research Institute (NRRI) and data from 18 field seasons. The Chippewa, Chequamegon-Nicolet, and Superior National Forests benefit from this partnership which provides excellent regional breeding bird data for songbirds. Results and methods are presented annually and revisions

are discussed to address any statistical and methodological issues. A methods revision for the Superior National Forest added point count sites to include lowland conifer habitat.

Through 2008, over 350,000 individuals of 173 species at over 22,210 point counts (3,700 hours of sampling) have been documented on the three national forests. On the Superior National Forest, point counts are located in 169 different stands in a variety of habitat types. Annual reports document population trends, trends of relative abundance, and population trajectory (an index of population size) for 49 species on the Superior (species with enough records to allow statistical analysis). Additionally, analysis is conducted on groups of species that are found in similar environmental conditions (guilds). Annual reports can be accessed at: http://www.nrri.umn.edu/mnbirds/birdcounts.htm

North American Breeding Bird Survey Route 50-071

Tofte Ranger District (2009 WFRP Report). The Breeding Bird Survey (BBS) is an international cooperative effort to monitor the status and population trends of North American landbirds. BBS data are collected by thousands of dedicated participants along thousands of randomly established routes throughout the continent. Professional BBS coordinators and data managers work closely with researchers and statisticians to compile and deliver population data and population trend analyses on more than 400 bird species, for use by land management agencies such as the Forest Service, other conservation managers, scientists, and the public. The results contribute to the national database used to monitor bird populations. On this route (Sawbill Landing 50071) 88 individual species have been detected. There are 10 additional BBS routes on or near the Superior National Forest. Results, including trend data, can be viewed at national, regional, State, and route-specific levels from the BBS website.

Monitoring Avian Productivity and Survivorship (MAPS)

All Districts (2009 WFRP Report). MAPS is the Monitoring Avian Productivity and Survivorship (MAPS) Program, a flagship project started by the Institute for Bird Populations in 1989. It is a cooperative effort among public agencies, private organizations, and individual bird banders to operate a continent-wide network of over 500 constant-effort mist netting stations. The Superior National Forest is home to one MAPS station at Weiss Creek (in its 3rd year) near Isabella in Superior's boreal forest region. This station supports, through staffing, another MAPS station at the Wolf Ridge Environmental Learning Center (now in its 16th year) near Finland, MN. The purpose of these stations is the long-term monitoring of populations and demographics (i.e. productivity and survivorship) for more than 120 landbird species to provide critical conservation and management information about their populations. On the Superior, our goals also include understanding how bird populations change over time in response to management and other environmental factors. With this understanding we can better identify causal relationships in bird population changes, formulate management plans to maintain stable populations, and evaluate the effectiveness of our management efforts.

Figure 9.b.4. Banding a cedar waxwing at the MAPS station.

The MAPS Program utilizes constant-effort mist netting and banding at a continent-wide network of monitoring stations. In Isabella, the MAPS station is staffed by professional biologists from each of the Superior's five districts and by highly trained volunteers. The MAPS station near Finland is managed by the Wolf Ridge Environmental Learning Center with the Forest Service providing assistance. MAPS protocol can be found at http://www.birdpop.org/maps.htm.

MAPS is organized around monitoring and research goals as well as management goals. MAPS data are used to describe temporal and spatial patterns in productivity and survivorship of target species and relationships between these patterns and population trends. Both the Wolf Ridge and Weiss Creek site are in a 50 acre mixed deciduous/coniferous upland site with inclusions of riparian habitats: The two sites differ some, with the Wolf Ridge site including maple areas while the Weiss Creek site is more representative of boreal transition forest (lacking maple).

In total, the Wolf Ridge station has banded or recaptured 290 individuals comprising 29 species. They've heard, observed, or banded 54 species at the site. At the Weiss Creek station in 2009, 200 total individuals of 33 species were banded or recaptured. A total of 64 species were observed or heard at the site. Of the 33 species banded, one of them was not heard or seen (Rose-breasted Grosbeak). The five most common species banded were Nashville Warbler, Ovenbird, Magnolia Warbler, Mourning Warbler, and Canada Warbler. The 2009 index of the adult population size (i.e. ratio of young to adult birds) was 1:4.8. Of the species heard but not captured, a few of the highlights for the season were Black-backed Woodpecker, Olive-sided Flycatcher (RFSS), Cape May Warbler, Boreal Chickadee, Red Crossbill, and White-winged Crossbill.

Owl Survey and Monitoring

All Districts (2009 WFRP Report). Owls were monitored on the Superior NF with three surveys. One is the Western Great Lakes Region Owl Monitoring survey (WGLROS). The partners include the MN DNR, Wisconsin Bird Conservation Initiative, and the Hawk Ridge Bird Observatory. Results of this survey are summarized below. Another is a long-standing (22 year) boreal owl breeding survey along drivable winter roads on the Tofte and Gunflint Districts led by cooperator/volunteer Bill Lane. A third uses nest boxes to help focus monitoring and determine use for boreal owls. The main goals of these efforts are to assess the distribution, status, and ecology of owls and in particular the sensitive boreal and great gray owls. This information is important to address habitat management for forest owls in northeast Minnesota. Lane's and the nest box surveys are discussed in the boreal owl section. Information from project surveys is used to help ensure vegetation management maintains owl habitat, especially for the boreal and great gray owls. Currently, there are 15 WGLROS routes within the SNF proclamation boundary, most of which are on the west side of the SNF. Of the 15 routes, 11 routes were surveyed in 2009, with a total of 25 owls comprising 3 species detected (15 northern saw-whet owls along 6 routes, 9 barred

owls along 5 routes, and one great gray owl along 1 route). The five years of WGLROM Survey will become more valuable at detecting trends as survey data accumulates. The great gray owl appears to exist as a breeding species at a constant, low level.

Large Stick Nest Monitoring

All Districts. Stick nests of a size suitable for owls and hawks are recorded in district databases. Nests are searched for and often found incidentally. In addition to wildlife biologist searches, personnel from numerous resources such as timber, fuels, silviculture, and recreation provide data on the locations of nests found while completing their field work. Many of these nests are monitored in early spring to determine if they are occupied by sensitive species such as northern goshawk or great gray owl and to monitor nest condition. Many nests are found to be unoccupied but a few have turned out to be alternate northern goshawk nests. When a nest is occupied, the data is incorporated into the occupying species' database and monitored for productivity.

Figure 9b.5.Raptor-sized stick nest in an aspen tree.

Butterfly Inventory and Monitoring Project

Tofte, Gunflint, and Laurentian Districts (2009 WFRP Report):
Butterflies and skippers were surveyed at seven blocks within the North Shore Highlands (NSH) ecological subsection of the Superior National Forest, in Cook and Lake Counties, from May 28 to July 20, 2009. This time period was chosen to coincide with: 1) maximum butterfly and skipper diversity and 2) the timeframe when these species would be most impacted in the event that the bacterial strain Bacillus thuringiensis kurstaki (Btk) is used to slow the spread of the gypsy moth, *Lymantria dispar* (Linnaeus).

Spring and early summer of 2009 were unseasonably cool, delaying the emergence of most butterfly species by at least three weeks. None of the twenty-seven species of butterflies and nine species of skippers recorded in 2009 were Regional Forester's sensitive species. It was not surprising that *Oeneis jutta* (Hübner), a sensitive species, was not found in 2009 as most records of *O. jutta* from Cook County are from even-numbered years. Most species of butterflies and skippers recorded were widespread, and in most years, either common or locally common. As many of the plants noted along roadsides and trails where butterflies and skippers were recorded are common throughout much of Cook and Lake Counties, it was not thought necessary to establish permanent survey locations. Butterflies and skippers were observed to be more common along partly shaded and mesic forest trails and roads than less shaded and xeric county roads.

Methods and Results for Monitoring of Single Species

This section discusses single-species monitoring efforts and results.
Single species accounts are arranged into two sections: 1) a table showing the population and habitat monitoring methods or data sources and 2) the results of population and habitat monitoring for each sensitive species.

The internet hyperlinks for cooperative projects, organizations, some reports, and the abbreviations used in the species accounts are listed below, although not all cited data is available at these websites. Also included are query parameters used to obtain population trend data at the sites.

BBS – The North American Breeding Bird Survey, 1966-2006, http://www.pwrc.usgs.gov/bbs/ BBS data is derived from the 1966-2006 trend estimates by region, using species population analysis for the Northern Spruce-Hardwoods physiographic region or strata (S28) (Sauer et al. 2008).
DNR - Minnesota Department of Natural Resources, http://www.dnr.state.mn.us/animals/index.html
FdLRMD – Fond du Lac Resource Management Division, http://www.fdlrez.com/newnr/main.htm
FS - Forest Service, http://www.fs.fed.us/r9/forests/superior/
HRBO – Hawk Ridge Bird Observatory, www.hawkridge.org
MAPS – Monitoring Avian Productivity and Survivorship, http://www.birdpop.org/maps.htm
Midwest Peregrine Society – www.midwestperegrine.org (Redig et al. 2008)
MOU – Minnesota Ornithologists' Union database queried for confirmed nesting records in Cook, Lake, and St. Louis Counties from 1960 to July 2010. http://moumn.org/
NABA – North American Butterfly Association, http://www.naba.org/
NABCI – North American Bird Conservation Initiative, http://www.stateofthebirds.org/ (NABCI 2010)
NRRI - Natural Resources Research Institute, University of Minnesota-Duluth, http://www.nrri.umn.edu/cwe/land.htm (Niemi et al. 2010)
NRS-FS – Northern Research Station, USDA Forest Service, http://www.nrs.fs.fed.us/atlas/ (Matthews et al. 2007)
USGS - US Geological Survey, http://biology.usgs.gov/
WGLROS – Western Great Lakes Region Owl Survey, www.hawkridge.org (Grosshuesch and Brady 2009)
WFRP – USDA Forest Service's Wildlife, Fish, and Rare Plants database, http://www.fs.fed.us/biology/managementsystem/index.html

Heather Vole (*Phenycomys ungava*)

Table 9b.1. Heather vole monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
None at this time	• Detections during annual long-term 1983-2009 small mammal monitoring project in central SNF (Jannett). • 1854 Treaty Authority small mammal monitoring project with no detections (2002-2009).	• DNR Biotics database tracks documented sites within SNF.	MIH 8b: Jack pine forest, mature+

Species monitoring: Six occurrences were recorded in the DNR Biotics database for both 2004 and 2009. Jannett (2009) continues to find heather voles during his small mammal monitoring but low numbers do not provide enough data to detect population trends. In 2009, two trapping sites yielded heather voles for the first time since trapping started in 1983. Jannett has collected 67 individuals as of the end of 2009 in one population or metapopulation.

Habitat Monitoring: Mature jack pine forest (MIH 8b) has increased from 1.0 percent in 2004 to 5.5 percent in 2009. This is within the Decade 2 desired trend. This amount of habitat is above the historical range of natural variation.

Peregrine Falcon (*Falco peregrinus*)

Table 9b.2. Peregrine falcon monitoring methods.			
Species Monitoring			Habitat Monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
•Midwest Peregrine Society Restoration Project 1986 -2009 monitoring.	•FS biologists follow up on breeding season sightings.	• DNR Biotics database tracks documented nest sites within SNF. •Midwest Peregrine Society monitors nests and productivity	Non-forest nesting habitat.

Species monitoring:*Peregrine Falcon Inventory and Monitoring (annual and long-term statewide)* Project *Gunflint and Tofte Districts (2009 WFRP Report*). There are four known breeding territories on the Forest that we monitor on a long-term basis. Our understanding of current peregrine falcon populations and breeding success in Minnesota and on the Superior NF is based primarily on nest observations and searches for new nests when adults are seen at new locations during breeding season. The result of project level surveys is nest protection for peregrine falcons in our management projects and tracking of long-term population changes as birds re-inhabit historical territories. In 2007, peregrine falcons were found to be nesting

in the Boundary Waters Canoe Area Wilderness (BWCAW) for the first time since their population crashed from DDT exposure in the 1960s. In 2009, we checked three known nests and found one new territory. Our data is contributed to regional tracking of peregrine falcon recovery and individual birds by the Midwest Peregrine Society.

Habitat monitoring: Nesting habitat is located along the North Shore of Lake Superior on non-federal lands and in the BWCAW. The latest data available from 2008 lists 17 nest sites in Cook and Lake Counties with a combined 241 young produced since 1988. Seven new nest sites have been found in Lake and Cook counties since 2004. Some suitable nesting habitat in the BWCAW has been surveyed (M. Grover, pers. obs.) but no new territories were found, indicating that there is available nesting habitat. Three new nests have also been found since 2004 north of the BWCAW in Ontario, adding to the chances of finding additional nests in the BWCAW in the future.

Sharp-tailed Grouse *(Tympanuchus phasianellus)*

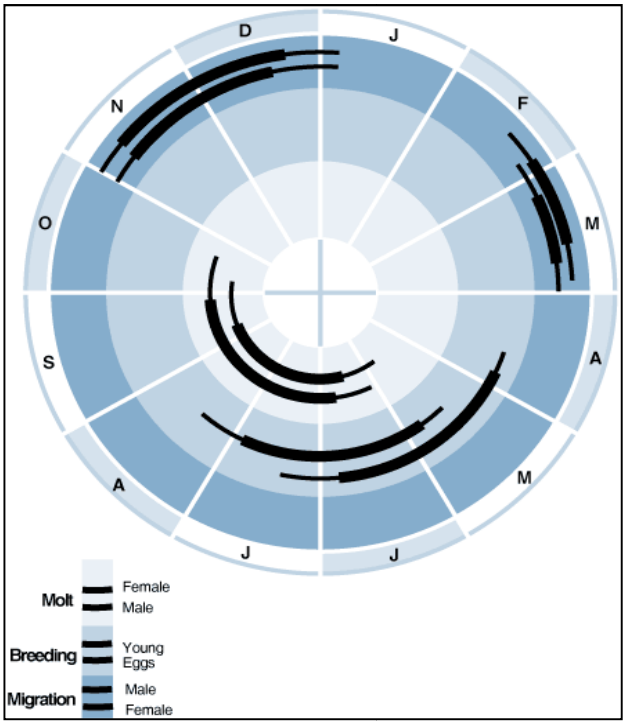
Table 9b.3. Sharp-tailed grouse monitoring methods.

Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
•BBS – national and regional trends	Currently none are conducted on SNF because there are no longer any known leks (breeding grounds).	MNDNR Sharp-tailed grouse and prairie-chicken lek surveys	Large patches of temporary non-forested uplands. Management-ignited fire opportunities.

Species monitoring: There are no known leks (breeding grounds) on the Superior National Forest to monitor. Incidental observations are outside the boundaries of the SNF. The Minnesota Ornithologists' Union (MOU) database shows no nesting records. BBS records show no significant population trend in the United States or Northern Spruce-Hardwood Bird Conservation Region.

Habitat monitoring: Habitat is not monitored because there are no known leks on the Forest.

Figure 9b.6. Annual cycle of breeding, migration, and molt of Sharp-tailed Grouse in North America. Thick lines show peak activity; thin lines, off-peak (from Poole 2005).



Yellow Rail *(Conturnicops noveboracensis)*

Table 9b.4. Yellow rail monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
None at this time	• DNR Biotics database tracks documented sites within SNF. • MOU records	None at this time	Non-forest wetlands.

Species monitoring: The DNR Biotics database shows only one location from 1993. MOU records from 1960-2004 show only three occurrences in St. Louis County from 2005 to 2009. All three occurrences are in the Sax-Zim bog, southwest of the SNF. There are no nesting records (NACBI, 2010).

Habitat monitoring: No yellow rail habitat monitoring was conducted in 2009. SNF management does not normally affect rail habitat.

Owl Survey and Monitoring

Table 9b.5. shows the number of observed and mean number of owls/route for great gray and boreal owls for the Laurentian Forest Province of Minnesota. Data in the table do not reflect population trends as data gathered to date shows the statistical power using current survey methods remains low for uncommon or hard-to-detect species such as great gray owl and boreal owl.

Table 9b.5. Number of observed and mean number of owls/route for great gray and boreal owls for the Laurentian Forest Province of Minnesota.				
Survey Year	Great Gray Owls		Boreal Owls	
	Number Observed	Mean*	Number Observed	Mean*
2005	14	0.18	2	0.003
2006	8	0.15	2	0.01
2007	7	0.03	0	0
2008	1	0.01	0	0
2009	2	0.01	0	0
*Average number of owls detected per route surveyed. Survey protocol may vary by year; see reports for number of survey routes and survey periods for any year.				

WGLROS Five-year route summary for Minnesota.
In Minnesota, 138 routes were surveyed at least once during the first five years of the owl survey (2005 to 2009). Nineteen (14 percent) routes were surveyed every year and 78 (57 percent) were surveyed in three or more years. The average number of owls detected per route was 5.9 with 31 routes having 10 or more detections (Table 9b.5). However, 34 of 138 routes featured no owl detections during years those routes were sampled. A Roseau County route totaled 69 owls over the first five years of the survey, which more than doubled the second highest route total of 26 owls. There were five routes (Aitkin, Beltrami, Koochiching, and St. Louis County) with five or more owl species over the first five years of the Survey (WGLROS 2009).

Great Gray Owl (*Strix nebulosa*)

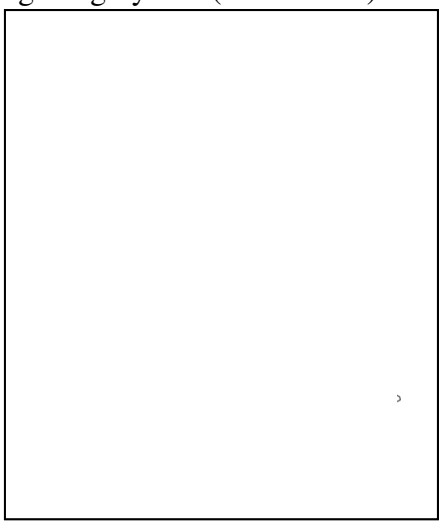
Table 9b.6. Great gray owl monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
• Western Great Lakes Owl Monitoring (HRBO 2005-2009)	• Project-specific surveys 2004-2009 in potential habitat	• DNR Biotics database tracks documented nest sites within SNF • NRRI	Nesting MIH 4b: Upland aspen-birch forest, mature+. MIH 5b: Upland conifer forest, mature+. Foraging MIH 5a: Upland conifer forest, young. MIH 9a: Lowland Black-Spruce-Tamarack young forest.

In addition to the objectives covering all RFSS, the following objective applies to this species: O-WL-21**.** In known or potential good breeding habitat, maintain or restore high quality habitat conditions: Mature (>50 years old), dense, upland forest nesting habitat within one-half to one and one-half miles of areas with a sufficient network of lowland conifer forest, bog, and non-forest foraging habitat.

Geographic information system data queries based on the key habitat analysis indicators and habitat adjacency are used to identify potential good breeding habitat of great gray owls during landscape level project planning. Project planning takes habitat for great gray owl and known nest sites in to account to retain breeding habitat, protect known nesting sites, and restore or create nesting habitat. Habitat buffers and retention of nesting and foraging

habitat are applied around known nests. Small scale projects are reviewed for their potential to impact known nests and mitigations measures are applied or nest sites are avoided (see landscape level project files).

Figure 9b.7. Year-round range of the great gray owl (Poole 2005).



Species monitoring: See Table 9b.5 for a summary of WGLROS data. MOU records show one nesting record in Lake County. The Biotics database listed two nests in 2004 and four nests as of 2009: the latest two were found and protected, and are annually monitored by FS biologists. NRRI observed one individual during forest breeding bird surveys between 1991 and 2002. There are approximately 36 great gray owl nesting platforms on the SNF since 2007. Platforms have been monitored every year with no detections as of yet. Great gray owls have been incidentally observed in about 25 locations on the Laurentian and Tofte Districts from October through May during 2005, 2008, and 2009, which includes the winter eruption of northern owls in 2005. There was one great gray owl found during Border Project surveys in 2007 with nest searches conducted but nesting not confirmed.

Habitat monitoring: Nesting habitat: Both MIH 4b and 5b are trending toward Forest Plan objectives, increasing the amount of 4b and decreasing the amount of 5b. MIH 5b is very close to the Decade 2 objectives.

Foraging habitat: MIH 9a is not trending in the upward Forest Plan direction and has decreased since 2004. Alternate foraging habitat is available in young upland conifer habitat, MIH 5a, which increasing as desired for the Decade 2 objectives.

Boreal Owl (*Aegiolus funereus*)

Table 9b.7. Boreal owl monitoring methods.

Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
None at this time	• Project-specific surveys 2004-2009 in potential habitat • Boreal owl survey projects (Lane, Belmonte, Wilson) • WGLROS	•Boreal owl nest sites, when located, are monitored to detect nesting success. • DNR Biotics database tracks documented nest sites within SNF • Boreal owl nest box project	Nesting MIH 4b: Upland Aspen-Birch mature+ MIH 5b: Upland conifer forest, mature+ Foraging, cover MIH 9b: Lowland Black-Spruce Tamarack mature+ forest. MIH 9b in patches of 100 acres or greater.

In addition to the objectives covering all RFSS, the following objective applies to this species: Forest Plan Objective: O-WL-20**.** In known or good potential breeding habitat within the normal expected range of the boreal owl on the NFS land, maintain or restore quality habitat conditions: suitable nesting habitat adjacent to or within ½ mile of foraging and roosting habitat. **(a)** Nesting habitat is generally provided by upland aspen and aspen-conifer mix forest >60 years old with large diameter (>12") trees suitable for nest cavities. **(b)** Foraging and roosting habitat is provided by lowland black spruce and tamarack forest predominantly >80 years old in stands >40 acres or where a complex of smaller lowland stands are within 1,000 feet of one another and are >40 acres. Individual territories (640-2,400 acres) typically have a combined area of greater than 500 acres of lowland black spruce/tamarack forest.

Geographic information system data queries based on the key habitat analysis indicators and habitat adjacency are used to identify potential good breeding habitat during landscape level project planning. Project planning takes habitat for boreal owl and known nest sites in to account to retain suitable nesting, foraging and roosting habitat, protect known nesting sites, and restore or create breeding and foraging habitat. Habitat buffers and retention of nesting and foraging habitat are applied around known nests. Small scale projects are reviewed for their potential to impact to known nests and mitigations measures are applied or nest sites are avoided (see landscape level project files).

Species monitoring: The Biotics database records twelve occurrences between 1988 and 1994, with no listings after 1994. NRRI (1991-2002) shows one occurrence of a single individual. See Table 6.5 for WGLROS results. One or no boreal owls have been found on survey routes conducted by Bill Lane since 2004 (pers. comm.). Lane's work has witnessed a dramatic decline in the boreal owl on the east side of the Superior NF.

Bill Lane has placed boxes on the east side of the SNF, but there are also 96 boxes on the west side which were put up about 2002. Those boxes have been monitored since 2002. Boreal owls used two of the boxes in 2009. One nest was successful and one failed.

This was the only year of known boreal owl use of these boxes and is likely another sign of their scarcity.

Roadside owl surveys on the Laurentian Ranger District, of differing intensity between years, found three boreal owls in 2003, two boreal owls in 2006, none in 2007-2008, and six boreal owls in 2009. There were four boreal owls found during the Border (2007) and Echo Trail (2006) project surveys, with nest searches conducted but nesting not confirmed.

Habitat monitoring: Nesting: Both MIH 4b and 5b are trending in the Forest Plan direction, increasing the amount of 4b and decreasing the amount of 5b. MIH 5b is very close to the Decade 2 objectives.

Foraging and cover: MIH 9b: Lowland Black-Spruce Tamarack mature + forest is about 5 percent greater than the Decade 2 objectives. MIH 9b in patches of 100 acres or more total 81,462 acres in 2009, greater than the acreage of 72,515 in 2004, and greater than the amount predicted for Decade 2; which was 74,893 acres.

Table 9b.8. Boreal Owl Habitat Patches	
Acres of MIH 9b in patches of 100 acres or greater.	
Year	Acres
2004*	72,515
2009	81,462
Decade 1 (2014)*	74,893
*Data from Forest Plan BE (USDA Forest Service 2004b), Boreal Owl Table 4, pp 90.	

American Three-toed Woodpecker *(Picoides dorsalis, formerly P. tridactylus)*

Table 9b.9. American three-toed woodpecker monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
None at this time	Project-specific surveys, 2006 •MOU records This species has never been detected on the NRRI songbird monitoring project or BBS.	None at this time	MIH 9b: Lowland black spruce-tamarack mature+ forest. Management-ignited fire opportunities. MIH 12: Upland interior forest, mature+.

In addition to the objectives covering all RFSS, the following objective applies to this species: O-WL-23. Maintain or improve quality nesting and foraging habitat within the woodpecker's range, by managing toward the Landscape Ecosystem Vegetation Objectives for mature and older conifer forest. Consider the contribution of BWCAW to well-distributed habitat. Important characteristics within these older forests include trees large enough for nest cavities and current or future habitat to provide dead and dying flaky-barked trees for forage. In addition to tracts of mature and older conifer forest, retain large concentrations of flaky-barked conifer trees (especially jack pine, white spruce, black spruce, and tamarack) that have been damaged or killed by fire, insects, disease, flooding or other disturbances. Where conflicts exist between retaining large concentrations (for example, due to fire risk or insect outbreaks), prioritize maintenance of woodpecker habitat in areas and concentrations where conflicts can be minimized.

O-WL-24. The amount and distribution of dead and dying trees should provide adequate representation of patterns and amounts that would result from natural disturbances (such as fire and flooding) and other ecological processes (such as insect and disease infestations and vegetation succession). If natural disturbances do not provide adequate habitat, it may be necessary to emulate natural disturbance through management ignited fire or other treatments.

Species monitoring: The MOU database shows no nesting records. BBS lists no significant population trend in the United States for 1966-2006 data. There have been two incidental observations of three-toed woodpeckers by Laurentian District biologists during 2007-2008. There have been four incidental observations by Gunflint District personnel, but none during the breeding season. NABCI (2010) analysis results show that this species has a medium vulnerability to climate change.

Figure 9b.8. This aerial view of part of the Cavity Lake fire shows the resulting suitable habitat for three-toed woodpeckers and olive-sided flycatchers.

Habitat monitoring:
MIH 9b: Lowland Black-Spruce Tamarack mature + forest acreage is about 5 percent greater than the Decade 2. MIH 12: Upland interior forest, mature and older acres are increasing rather than decreasing as predicted for Decade 2 as shown in Table 9b.10. Management-ignited fire data is not available at this time.

Table 9b.10. American three-toed woodpecker interior forest habitat.	
Acres of Upland Interior Forest, Mature and older	
Year	Acres
2004*	141,358
2009	144.791
Decade 2*	128,429
*Data from Forest Plan BE (USDA Forest Service 2004b), Three-toed Woodpecker Table 3, pp 99.	

Olive-sided Flycatcher (*Contopus borealis*)

Table 9b.11. Olive-sided flycatcher monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
•BBS – national and regional trends	• Project-specific surveys • MOU records.	None at this time	MIH 5b: Upland mature+ MIH 9b: Lowland black spruce-tamarack mature+ Management-ignited fire opportunities.

In addition to the objectives covering all RFSS, the following objective applies to this species: O-WL-25. Maintain, protect, or improve quality nesting and foraging habitat: variety of boreal forests (generally 10-20 percent canopy cover) including uplands, lowlands, edges, and beaver meadows with a preponderance of standing live or dead large trees used for perching and foraging, especially spruce or tamarack.

Species monitoring: The MOU database shows no breeding records in SNF counties. NRRI (1991-2002) listed 58 individuals during breeding season surveys. BBS adjusted trend data (1966-2006) show significantly decreasing population trends in the Northern Spruce-Hardwood Bird Conservation Region (-3.7 percent change per year, number of routes = 209) and in the United States (-3.2 percent change per year, number of routes = 526).

NABCI (2010) analysis results show that this species has a medium vulnerability to climate change and is listed as a species of conservation concern.

There have been incidental observations of male olive-sided flycatchers singing at two locations during June on the Gunflint District in 2005 and 2009. Surveys for the Tracks Project, on the Laurentian District, resulted in two locations of olive-sided flycatchers in 2008, with one sighting a possible nesting pair.

Habitat monitoring: MIH 5b: Upland conifer forest, mature +, is trending in the increasing direction for Decade 2. MIH 9b: Lowland Black-Spruce Tamarack mature+ forest is about 5 percent greater than the Decade 2 objectives. Management-ignited fire data is not available at this time.

Black-throated Blue Warbler (*Dendroica caerulescens*)

Table 9b.12. Black-throated blue warbler monitoring methods.

Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
• BBS – national and regional trends	• Project-specific surveys 2005-2009 in potential habitat	• DNR Biotics database tracks documented breeding season observations within SNF.	MIH 1b: Upland mature+ forest. MIH 1b in patches 2500 acres or greater.

Figure 9b.9. Male black-throated blue warbler.

Species monitoring:
The Biotics database shows 54 occurrences prior to 2004, and 61 occurrences as of 2009. NRRI (1991-2002) lists 126 individuals. The MOU database shows three nesting records in Cook County. BBS shows no significant population trend from 1966-2006 in the Northern Spruce-Hardwood Bird Conservation Region or the United States. Six occurrences of black-throated blue warblers have been recorded on the Tofte District during project surveys. Incidental occurrences on the Gunflint District have resulted in 17 new locations during mid-May through mid-July in 2004-2009. The Climate Change Bird Atlas (Matthews et al. 2007) predicts with high reliability a lower incidence rate and reduced range in northeast Minnesota for black-throated blue warblers under the averaged three low scenarios and the averaged three high scenarios for the year 2100 as compared to the current modeled scenario.

Habitat monitoring: MIH 1b: Upland mature+ forest is trending in the decreasing, moving in the direction for Decade 2 objectives. Mature and older MIH1 patches equal to or greater

than 2500 acres have increased in number, acres, and percentage since 2004 and are twice what was anticipated for Decade 2.

Table 9b.13. Black-throated blue warbler habitat.			
Summary of mature+ MIH1 patches equal to or greater than 2500 acres for the SNF not including BWCAW.			
	2004*	Decade 2*	2009
Number of Patches	23	12	24
Acres in Patches	120,197	65,111	135,220
% of Upland Forest**	13	7	14
* Data from Forest Plan Final EIS BE, Black-throated blue warbler Table 2, page 107. ** Total upland acres on federal ownership outside the BWCAW: 960,270, data from Forest Plan Final EIS BE, Black-throated blue warbler Table 3, page 108.			

Bay-breasted Warbler *(Dendroica castenea)*

Table 9b.14. Bay-breasted warbler monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
• BBS – national and regional trends	None at this time	None at this time	MIH 6b: Spruce/fir upland forest, mature+. MIH 9b: Lowland black spruce-tamarack forest, mature+. Upland and lowland mature+ forest in large (40-10,001 acres) patches.

Species monitoring: The MOU database shows no nesting records. BBS adjusted data (1966-2006) show a significantly decreasing population trend (-3.8 percent per year, number of routes = 152) in the Northern Spruce-Hardwood Bird Conservation Region and no significant trend for populations in the entire United States survey area. NABCI (2010) analysis results show that this species has a medium vulnerability to climate change and is listed as a species of conservation concern.

Table 9b.15. Bay-breasted warbler habitat.	
Summary of Mature+ MIH 5 and MIH9 patches (41-10,001 acres)	
Year	Acres
2004*	141,358
Decade 2*	128,429
2009	144,791
*Data from Forest Plan BE (USDA Forest Service 2004b), Three-toed Woodpecker Table 3, pp 99.	

Habitat monitoring: MIH 6b: Spruce/fir upland forest, mature+ is increasing, moving toward Forest Plan objectives. The MIH 9b: Lowland Black-Spruce Tamarack mature+ forest is about 5 percent greater than the Decade 2 objectives. The total amount of upland and lowland mature+ forest in large (40-10,001 acres) patches is greater than what existed in 2004 and greater than that expected in Decade 2.

Connecticut Warbler *(Opornis agilis)*

Table 9b.16. Connecticut warbler monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
•BBS – national and regional trends	• Project-specific surveys • MOU records.	• NRRI Forest Songbird Monitoring (1991-2002)	MIH 9b: Lowland black spruce-tamarack mature+ forest MIH 8b: Jack pine forest, mature+.

Species monitoring: NRRI Forest Songbird Monitoring (1991-2002) data include 160 individuals. The MOU data show one nesting record in each of Lake and Cook Counties. BBS adjusted trend data (1966-2006) shows a significantly decreasing trend (-2.9 percent per year, number of routes = 47) in the Northern Spruce-Hardwood Bird Conservation Region and no significant trend for the United States survey area. There were two incidental observations of Connecticut warblers on the Laurentian District during the Tracks Project surveys in late June of 2008. One occurrence of a Connecticut warbler was located during surveys on the Tofte District. NABCI (2010) analysis results show that this species has a medium vulnerability to climate change.

Habitat monitoring: MIH 9b: Lowland Black-Spruce Tamarack mature+ forest is about 5 percent greater than the Decade 2 objectives. Mature jack pine forest (MIH 8b) has increased from 1.0percent in 2004 to 5.5percent in 2009. This is within the desired trend for Decade 2.

Le Conte's Sparrow *(Ammodramus leconteii)*

Table 9b.17. Le Conte's sparrow monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
•BBS – national and regional trends	• MOU records	None at this time	MIH 1a: Upland young forest. MIH 9a: Lowland black spruce-tamarack young forest. Management-ignited fire opportunities. Road and trail construction.

Species monitoring:
MOU: no nesting records but one location of a bird on July 1, 2007 on the Gunflint District.
BBS: no significant trend in the Northern Spruce-Hardwood Bird Conservation Region and a significant increasing trend in the United States (2.5, N = 62).

Habitat monitoring: MIH 1a is not trending toward the Forest Plan objectives and is higher than the Decade 2 objective. MIH 9a is not trending in the upward Forest Plan direction, has decreased since 2004. The reduction in MIH 9a may reduce ephemeral habitat, that lasting 10 years or less, for LeConte's sparrow. Management-ignited fire data is not available at this time. Since 2004, system road mileage has increased while total road

mileage has decreased, 133 miles of road will be decommissioned when decisions up to 2009 are implemented, and contractual practices and techniques effectively prevented motorized recreation vehicle travel on 80 percent of decommissioned roads.

Figure 9b.10. Le Conte's sparrow

Wood Turtle *(Clemmys insculpta)*

Table 9b.18. Wood turtle monitoring methods.

Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
None at this time	• Nesting site monitoring by FS and FdLRMD biologists	• DNR Biotics database tracks documented sites within SNF.	Riparian disturbances. Road and trail construction.

In addition to the objectives covering all RFSS, the following objective applies to this species: O-WL-19. In all known breeding locations maintain or restore high quality breeding habitat and protect nesting areas from predators and negative human impacts. High quality breeding habitat: open sandy areas adjacent to upland and lowland foraging habitats with shade and security over wood. Aquatic riverine habitat features log jams, down logs, wood debris.

Species monitoring: Biotics database lists 15 occurrences as of 2004 and 16 as of 2009. Biotics occurrences range from one to 525 individuals and one to 81 nests. Some sites have been visited in multiple years with turtles found each visit. Known nesting populations within the SNF are monitored by our biologists on federal land and Fond du Lac Reservation Resource Management Division biologists on private land. Monitoring takes place each year for new nests and presence of adult females in known and suitable habitat. Long-term monitoring occurs on some individual females because they are still tagged as a result of a monitoring project in the 1990s. In 2009, Forest Service biologists found 14 female turtles, 3 male turtles, and 7 juvenile turtles (under 10 years of age) along the Cloquet River drainage. Turtles were photographed for future identification, measured, and checked for breeding status. One female turtle was found at a new nesting area along the Saint Louis River and a new male was found at a new location on the Cloquet River.

Figure 9b.11. The rings on the plastron, or lower shell, can be used for aging wood turtles.

The Cloquet River Management plan is used to guide management actions. Seasonal restrictions have been designed for riparian disturbances near nesting locations. No changes in roads near nesting habitat have taken place. Locations of the nesting areas are protected information to reduce the likelihood of collection as pets or by the pet trade. Road mortality has been documented in the past at locations were wood turtles nest on road shoulders.

Habitat monitoring: Nesting habitat is reliant upon natural river disturbance processes and maintenance of existing nesting areas. In 2009, the Youth Conservation Corps conducted additional wood turtle surveys along rivers and streams that had historic locations of wood turtles or higher probability of occupancy based on habitat. No turtles were located during these surveys. Since 2004, system road mileage has increased while total road mileage has decreased, 133 miles of road will be decommissioned when decisions up to 2009 are implemented, and contractual practices and techniques effectively prevented motorized recreation vehicle travel on 80 percent of decommissioned roads.

Taiga Alpine Butterfly *(Erebia mancinus)*

Table 9b.19. Taiga alpine butterfly monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
• Northern Crescents Chapter of NABA annual surveys	• Butterfly surveys (MacLean)	• DNR Biotics database tracks documented sites within SNF	MIH 9b: Lowland Black-Spruce- Tamarack mature+ forest

In addition to the objectives covering all RFSS, the following objective applies to this species: O-WL-26. In all known breeding locations, maintain or restore high quality habitat for: Taiga alpine: semi-open to well forested lowland black spruce-tamarack.

Species monitoring: Biotics database lists 3 occurrences (1975-1982)

Habitat monitoring: MIH 9b: Lowland Black-Spruce Tamarack mature+ forest is about 5 percent greater than the Decade 2 objectives.

Red-disced Alpine Butterfly *(Erebia discoidalis)*

Table 9b.20. Red-disced alpine butterfly monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
• Northern Crescents Chapter of NABA annual surveys	• Butterfly surveys	None at this time	MIH 9b: Lowland Black-Spruce-Tamarack mature+ forest; Non-forest wetland

Figure 9b.12. Red-disced alpine

Species monitoring: Plouff Creek site monitored by MN DNR specialists in 2009 and 4 individuals were found.

Habitat monitoring: MIH 9b: Lowland Black-Spruce Tamarack mature + forest acreage is about 5 percent greater than the Decade 2 objectives. SNF management does not normally affect non-forest wetland habitat nor is that habitat monitored.

Jutta Arctic Butterfly *(Oeneis jutta aserta)*

Table 9b.21. Jutta arctic butterfly monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
• Northern Crescents Chapter of NABA annual surveys	None at this time	None at this time	MIH 9b: Lowland Black-Spruce- Tamarack mature+ forest, Non-forest wetland.

O-WL-26. In all known breeding locations, maintain or restore high quality habitat for: Jutta arctic: moderately forested black spruce bogs with sedges, bog forest openings and edges.

Species monitoring: Two jutta arctics were found during the 2009 butterfly count on the Laurentian District in 2009.

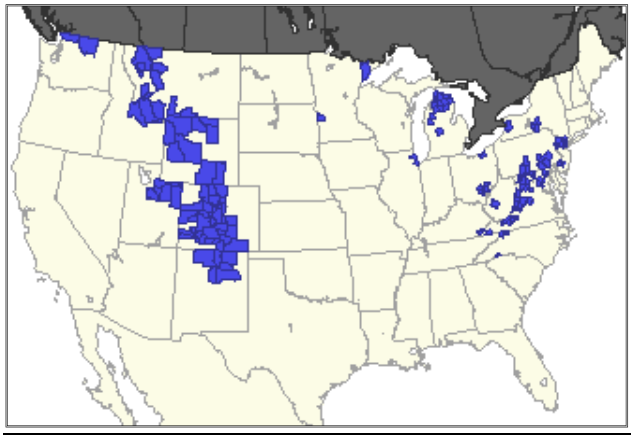
Habitat monitoring: MIH 9b: Lowland Black-Spruce Tamarack mature+ forest is about 5 percent greater than the Decade 2 objectives. SNF management does not normally affect non-forest wetland habitat nor is that habitat monitored.

Freija's grizzled Skipper *(Pyrgus centaureae freija)*

Table 9b.22. Freija's grizzled skipper monitoring methods.

Table 9b.22. Freija's grizzled skipper monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
• Northern Crescents Chapter of NABA annual surveys	• Periodic site monitoring by SNF and Northern Crescents Chapter of NABA	• DNR Biotics database tracks documented sites within SNF.	Non-forest.

Figure 9b.13. Breeding range of Freija's grizzled skipper in the US (Opler et al. 2010).



In addition to the objectives covering all RFSS, the following objective applies to this species: O-WL-26. In all known breeding locations, maintain or restore high quality habitat for: Freija's grizzled skipper: upland acid meadow (US range map in Figure 9b.13).

Species monitoring: Biotics database lists one occurrence where the species was found 12 times from 1967-1982. Freija's grizzled skipper is not listed in the Northern Crescents' survey results.

Habitat monitoring: SNF management does not normally affect non-forest habitat nor is that habitat monitored.

Nabokov's Blue Butterfly *(Plebejus idas nabokovi;* Synonym, *Lycaeides idas nabokovi)*

Table 9b.23. Nabokov's blue butterfly monitoring methods.			
Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
• Northern Crescents Chapter of NABA annual surveys	• Project-specific surveys • Butterfly surveys	• DNR Biotics database tracks documented sites within SNF.	MIH 8a: Jack pine forest - young

In addition to the objectives covering all RFSS, the following objective applies to this species: O-WL-27. In eight known breeding locations, maintain or restore high quality

habitat: well-drained sand gravelly areas under fairly open coniferous forests, especially jack pine of the Vermilion Moraine. Species is associated with its exclusive larval host - dwarf bilberry.

Species monitoring: DNR Biotics database lists 29 occurrences at 19 sites more than one mile from each other (1964-2008). Seventeen occurrences have been revisited since 2004 and 3 new occurrences have been found since 2004. Plouff Creek site monitored in 2009 and four males and six females were found. Observations of one to more than 10 individuals have been recorded from five sites on the Laurentian District in 2008 and 2009.

Nabokov's Blue Butterfly and Dwarf Bilberry Inventory and Monitoring (annual)
Gunflint, Tofte, and Laurentian Districts (2009 WFRP Report): The number of known breeding locations of Nabokov's blue butterflies continues to increase each year. Two new locations, which may not be in the Biotics database at this time, increase the known Nabokov's blue butterfly sites to four on the Laurentian District. Known locations of Nabokov's blue butterfly occur within a band from 6 to 24 miles from Lake Superior.

Figure 6.14. Fruiting dwarf bilberry plants.

NABA butterfly counters at the McNair site have recorded Nabokov's blue butterflies during 2005-2007, with count data unavailable for 2008-2009. The count near Grand Marais also recorded Nabokov's blues found in 2003 and 2007, with count data unavailable for 2004-2006 and 2008-2009.

Habitat monitoring: MIH 8a is increasing toward the Forest Plan objective. Project surveys include looking for dwarf bilberry and monitoring new patches of bilberry for butterfly presence (Figure 6.14). Mitigations for protection and habitat enhancement are used for a landscape scale project areas containing known breeding locations. Protective mitigations such as vehicle traffic restrictions have been applied to activities near known sites.

Laurentian Tiger Beetle *(Cicindela denikei)*

Table 9b.24. Laurentian tiger beetle monitoring methods.

Species Monitoring			Habitat monitoring
Population Monitoring	Presence/No Detection	Breeding Territory & Productivity	Key Habitat Analysis Indicators
None at this time	• Project-specific surveys including various road maintenance and gravel pit development projects.	• DNR Biotics database tracks documented sites within SNF	Forest openings. Roads, trails, gravel pits.

Species monitoring: Biotics database (1979-2004) lists 49 occurrences.

Habitat monitoring: Roads, trails, gravel pits: gravel pits are often monitored for presence prior to specific project work. Since 2004, system road mileage has increased while total road mileage has decreased, 133 miles of road will be decommissioned when decisions up to 2009 are implemented, and contractual practices and techniques effectively prevented motorized recreation vehicle travel on 80 percent of decommissioned roads.

Implications

Species Populations

Data on the habitat conditions and populations for each sensitive species indicates which species are well monitored and which could be monitored more fully, if possible. The data gives us baseline information against which to judge the effects of management actions; however, population trends and challenges to viability are much more complicated and require a risk assessment. Risk assessments are completed during sensitive species reviews and are beyond the scope of this monitoring report.

A recurring concern reflected in species' accounts used to evaluate population levels is climate change. As an emerging issue, this subject is reviewed in Subsection 3.

Sensitive Species Data

Data management is critical to recording our monitoring efforts, understanding species trends and the implications of our management, and communicating and sharing data with partners. Data management is also critical to our contribution to cross-border species whether data is shared among agencies in Minnesota or with Ontario.

A concern found while completing this report is the time required to gather pertinent information for each species because of the numerous databases created and maintained by partnering agencies and organizations. Upkeep of databases is a constant challenge of time and expense but it is not realistic to expect that any one database could consolidate all the various types of data gathered for the wide diversity of monitoring conducted for birds, mammals, and insects. District records are available from District biologists, but gathering this information adds time to projects covering more than one zone or the whole Forest.

Monitoring the full suite of sensitive species

The Superior National Forest and multiple agency/organization population monitoring programs are designed to complement and not overlap or compete for resources; yet we require more biological knowledge such as habitat related information, and breeding season locations. This specific information aids us in addressing conservation issues such as climate change induced range shifts for both sensitive species and their habitat, and to apply site-specific mitigations.

Sensitive species which are not surveyed or monitored, or monitored in only a minimal fashion are: yellow rail, three-toed woodpecker, olive-sided flycatcher, bay-breasted warbler, Connecticut warbler, Le Conte's sparrow, taiga alpine, red-disced alpine, jutta arctic, and Freija's grizzled skipper. Detailed information on the biology of some of our sensitive species is limited, as are the specific sites they occupy on the Forest. For some sensitive species, there are no known methods to adequately monitor to evalutate population trends. We are applying course-filter management strategies, but we are not contributing to

fine-filter management strategies for species we are either not monitoring or unable to monitor. We and other contributing agencies and organizations are successfully monitoring some of the species that are sensitive on the SNF and we continue to evaluate which species might be affected by management and for which species there are valid monitoring techniques.

Lowland conifer species monitoring

Figure 9b.15. Wetland complex with irises blooming on the edge of a bog and mature, lowland black spruce in the distance.

Mature lowland conifer is used by more RFSS than any other MIH (8 of 19 species analyzed). Young lowland conifer is used by Le Conte's sparrows and great gray owls. Mature lowland conifer complexes of varying size and vegetative composition and structure are used by eight RFFS (boreal owl foraging, three-toed woodpecker, olive-sided flycatcher, bay-breasted warbler, Connecticut warbler, taiga alpine, red-disced alpine, and jutta arctic).

Lowland conifer (MIH 9a and 9b) acreage is increasing in age and MIH 9a is not trending towardForest Plan direction to meet Decade 2 objectives. Meeting targets for lowland conifer age classes would result in increased harvesting of mature lowland conifer.

Systematic surveys and monitoring are completed for the two owl species but the other eight species using lowland conifer are only incidentally recorded and would benefit from targeted surveys. The butterflies are surveyed in specific known locations but potential treatment areas could use surveys to determine presence of the butterflies and define local mitigations. Monitoring in paired unburned and recently burned lowland conifer stands would improve our understanding of fire disturbance dependency for Le Conte's sparrows, three-toed woodpeckers, and olive-sided flycatchers.

Recommendations

1. Sensitive Species Data

Consolidate on-Forest sensitive species monitoring data to the extent possible. There may be an up-front increase in workload to build and enter data into the database, but that would be offset by increased efficiency in using the data across the Forest for a wide range of projects. At this time, a Forest-wide database for those species not already covered by the Biotics (MN DNR 2010) database, and open only to Forest biologists is recommended. Any information on sensitive species is subject to FOIA, but with the permission of the requestor, redaction of specific locations has been a protective solution in the past and is a good one for the future.

Use of the NRIS Wildlife database may consolidate on-Forest data, reducing time for in-house data gathering, but potentially increasing time spent on data entry. A major concern in using the NRIS Wildlife database is that sites for sensitive species are available to any NRIS user and may be available to the public in the future. Availability of site specific data, especially to the general public, could reduce our ability to protect and conserve sensitive species by putting desirable species at risk to human disturbance during critical breeding periods or harm. Allowing the availability of site specific data to any NRIS user may result in otherwise well intentioned, non-biologist Forest Service personnel disturbing sensitive species during the critical breeding periods.

2. Monitoring the full suite of sensitive species
Continue to develop or apply appropriate survey and monitoring techniques for sensitive species and for species added to the sensitive species list.

3. Lowland conifer species monitoring
Increase sensitive species surveys and monitoring in lowland conifer complexes.

Subsection 2. Habitat

Monitoring Question

Sensitive species monitoring addresses the monitoring question from Chapter 4 of the Forest Plan:

> To what extent is Forest management contributing to the conservation of sensitive species and moving toward short- term (10-20 years) and long-term (100 years) objectives for their habitat conditions?

Forest Plan Objectives for all terrestrial sensitive species are:

O-WL-2. Habitats: Move terrestrial habitats in the direction of desired conditions and objectives for all native and desired non-native species. O-WL-18. Maintain, protect, or improve habitat for all sensitive species. Meeting this objective will involve two basic and complementary strategies that would be implemented based on species' habitat requirements and distribution, individual site conditions, expected management impacts, and other multiple use objectives. These strategies include: (**a**) Landscape level (or coarse filter) management strategies: Addressing species' needs through integrated resource management at large landscape scales including, but not limited to,: Landscape Ecosystem or Landtype Association scales for vegetation and management indicator habitat objectives; watersheds

for aquatic and riparian condition objectives; and Management Areas for desired or acceptable levels of human uses. **(b)** Site-level (or fine filter) management strategies: Addressing species' needs by managing specifically for high quality potential habitat or known locations of sensitive species.

Monitoring is driven by over-arching Desired Conditions for terrestrial wildlife in Forest Plan direction (D-WL-1-9, pages 2-27 through 2-28) which describe how the Forest should look and function if the Plan is successfully implemented.

The monitoring question *'To what extent is Forest management contributing to the conservation of sensitive species and moving toward short- term (10-20 years) and long-term (100 years) objectives for their habitat conditions?*' is appropriate for sensitive species because most of our sensitive species are rare, have limited distribution, have declining or unknown population trends and occur in habitats that are commonly affected by our management. Monitoring allows us to evaluate whether we are contributing to the conservation of sensitive species and the habitats upon which they depend. Monitoring sensitive species helps the Forest learn of management actions that may affect species and adapt those actions to maintain viability of populations. Monitoring allows us to determine if we are meeting or moving toward the desired conditions of diverse, healthy, productive, and resilient wildlife habitats for sensitive species. It also gives us a chance to reevaluate species population trends and risks considering the latest scientific information.

The units of measure chosen were: 1) Trends in management indicator habitat compared to 2004 conditions, Decade 2 objectives (coarse filter) and 2) Habitat improvement projects undertaken in 2009.

These units of measure are effective and appropriate because they track changes in habitat necessary to support viable sensitive species populations. Tracking our habitat maintenance and enhancement projects helps us identify the extent to which our management contributes to the conservation of sensitive species and their habitats and promotes ecosystem sustainability and biological diversity in the landscape context of Northern Minnesota.

Projections of MIH acreage were most often calculated for Decade 2 in the Forest Plan FEIS, with a few calculated for Decade 1, therefore most comparisons of current conditions to future habitat are for Decade 2 projections. Geographic information systems were used to gather and analyze changes in MIH as compared to 2004 data used in the Forest Plan revision. Habitat improvement at any site often benefits multiple species and was summarized for all sensitive and threatened and endangered species.

Habitat units of measure meet terrestrial wildlife objectives for native and desirable non-native wildlife (O-WL-2) and humans (O-WL-3). Habitat units of measure reflect the landscape level (or coarse filter) and site level (or fine filter) management strategies listed in the Forest Plan objectives for sensitive species (O-WL_18 and G-WL-12). Key habitat analysis indicators are taken from the Forest Plan Biological Evaluation, Table 3.

Methods for Monitoring Habitat Objectives

Trends in management indicator habitat

Evaluation of habitat through comparisons of percent of MIHs is covered for each species for which an MIH is listed in its species account.
The following MIH are evaluated, where the letter a represents young forest and b represents mature and older forest (See Appendix C in the Forest Plan for forest type and ages):

MIH 1a and 1b: Upland forest
MIH 4b: Aspen-birch and mixed aspen-conifer forest
MIH 5a and 5b: Upland conifer forest
MIH 6b: Upland spruce-fir forest
MIH 8 and 8b: Jack pine forest
MIH 9a and 9b: Lowland black spruce-tamarack forest
MIH 12: Upland interior mature forest

Management Indicator Habitats are used to track habitat trends for sensitive species on Superior National Forest lands and are presented in the Habitat Monitoring section and in individual species accounts. Habitat changes resulting from anticipated landscape scale vegetation management project decisions are reflected in the MIH habitat results. Vegetation succession is also applied to age forested stand types. The projects are listed by the year they were signed:

2009: Border, Clara, Glacier, Maple Hill, Echo Trail
2008: Cascade, Ham Lake
2007: Devil Trout, Fernberg Thinning, Mid-Temperance, Whyte
2006: Inga South
2005: Dunka, East Side Thinning
2004: Tomahawk, Virginia

All information on these projects can be found on the SNF website: www.fs.usda.gov/superior located under "Land and Resources Management" then "Projects". The reason only these large projects are cited is because these projects generally have the most impact on RFSS and part of their purpose is to maintain or enhance habitat for RFSS. RFSS monitoring in a project area may begin up to three years prior to the date of the decision; meaning that monitoring has been conducted for currently on-going projects for the last several years in addition to that conducted for completed projects.

Management Indicator Habitat by percent of the federal ownership within the Superior National Forest boundary outside the BWCAW is compared for the 2004 condition, projected 2014 condition including management decisions and modeled succession, and the Decade 2 objectives of the Forest Plan. The data representation has been separated into two charts to better reflect the variation at the lower end of the data spectrum. Figure 6.16, on page 9b.34, compares MIH with RNV data that is below 9 percent of federal ownership acres. In contrast, Figure 6.17, compares MIH with RNV data that is greater than 9 percent of federal ownership acres. Nine percent is used to separate data in the charts simply because it is a natural break in the data and makes it easier to evaluate changes to small percentages over a range of 0 to 14 percent, rather than if they were grouped on a scale of 1 to 100 percent.

Range of natural variation (RNV) is compared as a reference used in the Forest Plan revision to help determine MIH objectives.

Habitat improvement projects which maintain or enhance sensitive species habitat are listed below. Wildlife, Fish, and Rare Plants (WFRP) Reports for 2009 (USDA FS 2010) report accomplishments of projects aimed at maintaining or enhancing wildlife habitat which are sometimes aimed specifically at a sensitive species or benefit sensitive species through habitat creation or restoration. The WFRP reports reflect projects funded with wildlife dollars (NFWF) that are developed by district biologists in response to sensitive species needs. Monitoring of habitat and species tracking has been recorded in numerous reports in the WFRP database (Project File).

Results for Habitat Objectives

Trends in Management Indicator Habitats

Those MIHs analyzed for sensitive species which are trending toward Forest Plan objectives for Decade 2 are:

1b, mature upland forest;
4b, mature aspen-birch and mixed aspen-conifer forest;
5a, young upland coniferous forest;
5b, mature upland coniferous forest;
6b, mature upland spruce-fir forest;
8a, young jack pine forest; and
9b, mature lowland conifer

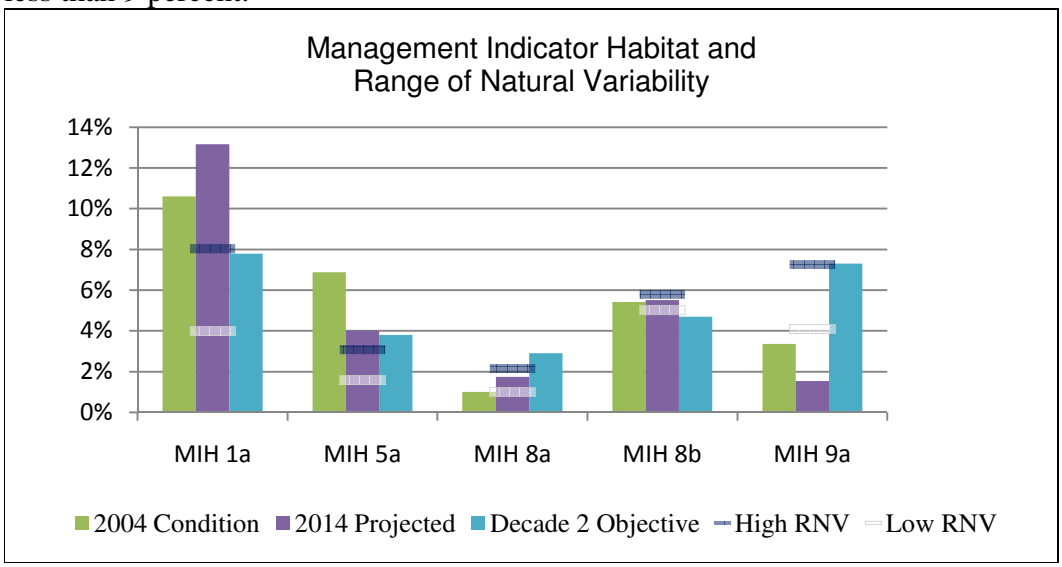
RFSS that use these MIHs are great gray owl and boreal owl nesting and foraging, three-toed woodpecker, olive-sided flycatcher, black-throated blue warbler, bay-breasted warbler, Connecticut warbler, taiga alpine, red-disced alpine, jutta arctic, and Nabokov's blue butterfly.

Those MIHs analyzed which are not trending toward Forest Plan objectives for Decade 2 are: 1a, young upland forest; 8b, mature jack pine; and 9a, young lowland conifer forest.

The RFSS that use these MIHs are heather vole, great gray owls (foraging), Connecticut warbler, and Le Conte's sparrow.

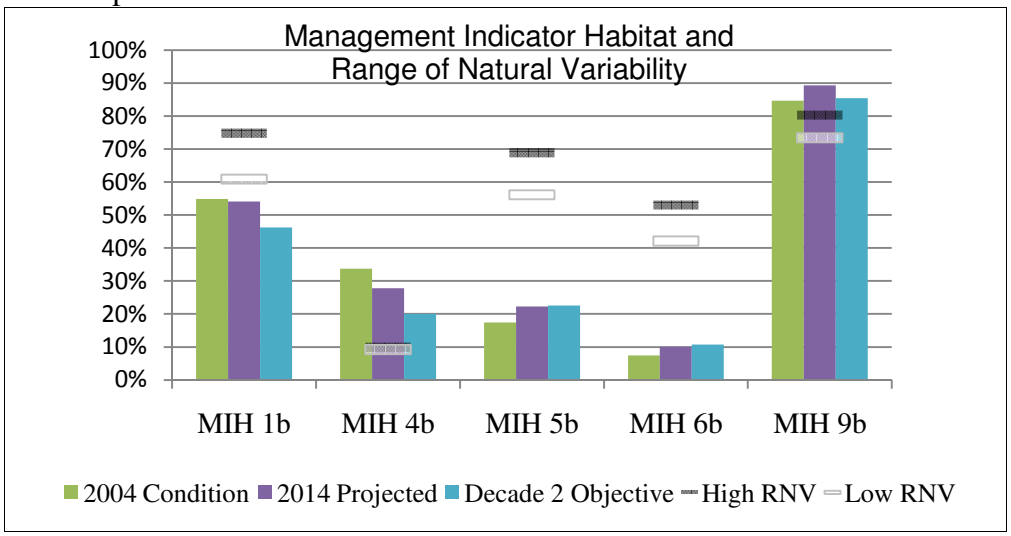
All MIH trend data is available in the M&E Report Project File.

Figure 9b.16. Management indicator habitat and range of natural variability less than 9 percent.



Those MIHs analyzed for sensitive species which are trending toward Forest Plan objectives for Decade 2 are: MIH 1b, mature upland forest; 4b, mature aspen-birch and mixed aspen-conifer forest; 5a, young upland coniferous forest; 5b, mature upland coniferous forest; 6b, mature upland spruce-fir forest; 8a, young jack pine forest; and 9b, mature lowland conifer.

Figure 9b.17. Management indicator habitat and range of natural variability above 9 percent.



Those MIHs analyzed for sensitive species which are not trending toward Forest Plan objectives for Decade 2 are: MIH 1a, young upland forest; 8b, mature jack pine; and 9a, young lowland conifer forest.

Multi-Species Habitat Improvement

In 2009, habitat improvement was accomplished on 14,662 acres (USDA Forest Service 2009 and project file). Habitat improvement on any acre may benefit more than one sensitive species, so resulting acres are summarized, and specific projects are listed below.

Terrestrial Threatened, Endangered and Sensitive Species Habitat Improvement

All Districts) (2009 WFRP Report)

Project activities took place at various locations across the Superior National Forest and on all five ranger districts. This project successfully realized the following core and integrated targets:

- Created 292 acres of young forest habitat through timber harvest for early seral species such as deer, moose and snowshoe hare
- Enabled 900 acres of conversion planting and diversity planting of conifer to improve future habitat conditions for sensitive bird species such as bald eagle and other animals
- Enabled 800 acres of release and pruning of established conifer trees to improve their chances of survival
- Enabled 40 acres of shearing and brushing of decadent brush or under growth to improve habitat conditions for a variety of species.

In addition, this project improved 500 acres of lynx habitat through the decommissioning of unneeded roads; and 1,470 acres of prescribed burning to improve habitat conditions within the BWCAW which is considered Canada lynx refugia habitat.

Terrestrial Wildlife Habitat Restoration and Improvement

All Districts (2009 WFRP Report)

Project activities took place at various locations across the Superior National Forest and on all five ranger districts. This project successfully realized the following core and integrated targets:

- Created 2,700 acres of young forest habitat through timber harvest for early seral species such as deer and moose
- Enabled 650 acres of conversion planting and diversity planting of conifer for future habitat for several birds and other animals
- Enabled 400 acres of release and pruning of established conifer trees to improve their chances of survival
- Enabled 40 acres of shearing and brushing of decadent brush or under growth to improve habitat conditions for a variety of species
- Conducted 2,400 acres of prescribed fire to improve habitat conditions in the Boundary Waters Canoe Area Wilderness.

LaCroix District Oak/Blueberry Habitat Enhancement Projects

LaCroix Ranger District (2009 WFRP Report)

The eventual outcome is a healthy multi-age oak stand with abundant blueberry in the understory. These stands would have improved soft and hard mast production thereby enhancing habitat for a variety wildlife species. This will help provide a representation of the full spectrum of habitats and conditions that would have resulted from natural cycles.

Wildlife Openings Maintenance/Enhancement

LaCroix Ranger District (2009 WFRP Report)

Maintain small, early successional and/or grassy openings which are used by various wildlife species. To improve the benefits these openings provide, establish a variety of mast and fruit producing shrubs in these openings.

Riparian Planting

All Districts (2009 WFRP Report)

The objective of lake and stream riparian planting projects is to establish or reestablish long-lived tree species such as white pine, red pine, northern white cedar, and white spruce within riparian areas. Planted trees eventually grow to maturity and help to improve lake and stream habitats by increasing shade and cover, promoting bank stability, and enhancing recruitment of large woody debris. During the months of April through June of 2009, the fisheries and aquatic program conducted hand planting along several lakes on the east zone of the Superior National Forest. As a result of the East Zone Riparian Planting Projects, the Superior National Forest successfully completed 12 lake acres by planting along riparian corridors of lakes.

Figure 6.18. Biologists planting long-lived tree species in a riparian area to create habitat.

During the months of April through June of 2009, the Laurentian Ranger District completed three stream riparian habitat improvement projects on Dark River, Big 39 Creek, and Two Deer Lake. These consisted of planting and releasing riparian tree species along lake and stream corridors. As a result of the West Zone Stream Riparian Planting Projects, the Superior National Forest successfully completed 12.5 land acres (with 800 trees planted at two 2 acre plots and approximately 1000 trees planted at one 8 acre plot at Two Deer Lake), and 3.5 stream miles of habitat improvement on Big 39 and Dark River in 2009.

Manitou Collaborative

Tofte Ranger District (2009 WFRP Report)

The partners of The Manitou Collaborative have joined to manage the ecosystem of a 100,000 acre landscape as a joint enterprise among several landowners. The collaborative began in 2000 and includes: USFS, The Nature Conservancy (TNC), Minnesota DNR, The Environmental Learning Center, and Lake County (Minnesota). The landscape is a northern Minnesota mesic, mixed forest, and includes parts of three watersheds.

All partners have agreed to mutually manage the vegetation to mimic the range of natural variability with the intent of restoring diverse, multi-aged forests; large patches of varying growth stages; and more, older patches; while also supporting the local economy and seeking management efficiencies through cooperation.

The first project will create an approximately 800 acre patch of young, vegetative growth stage. Harvest will begin in 2010. It is mostly on State land, with a small portion on federal land. The intent is to develop a large patch of mixed forest, restore white pine and white spruce, discourage aspen, and eventually develop a multi-aged forest with the kind of diversity and structure formerly maintained under natural disturbance conditions. The federal biologists' have been involved with the collaborative for several years. With assistance from TNC, the FS drafted the NEPA documents for this project in 2007 and 2008. During this time, the State timber sales were also marked. This year the federal timber sale blocks were marked, agreements were drafted and signed between the State, TNC, and FS to install a 33 ft bridge necessary for access across the Manitou River. The bridge valued at approximately $25,000 was donated by a State agency. In addition, the company, 3-M, donated $25,000 for the project. The collaborative is beginning to plan for the next project area.

Implications

Seven MIH used for evaluating sensitive species habitat are trending toward Forest Plan objectives for Decade 2: 1b, mature upland forest; 4b, mature aspen-birch and mixed aspen-conifer forest; 5a, young upland coniferous forest; 5b, mature upland coniferous forest; 6b, mature upland spruce-fir forest; 8a, young jack pine forest; and 9b, mature lowland conifer. RFSS that use these MIHs are great gray owl and boreal owl nesting and foraging, three-toed woodpecker, olive-sided flycatcher, black-throated blue warbler, bay-breasted warbler, Connecticut warbler, taiga alpine, red-disced alpine, jutta arctic, and Nabokov's blue butterfly.

Three MIH used for sensitive species habitat indicators are not trending toward Forest Plan objectives for Decade 2: 1a, young upland forest; 8b, mature jack pine; and 9a, young lowland conifer forest. The RFSS that use these MIHs are heather vole, great gray owls (foraging), Connecticut warbler, and Le Conte's sparrow.

The MIH that are not trending toward Forest Plan objectives may disadvantage some RFSS, while at the same time an increase in habitat may positively influence sensitive species populations. Many of the species use additional habitat types and populations are dependent on many variables in addition to habitat.

Recommendations

1. Continue implementation of sensitive species' habitat projects in appropriate ranges and suitable habitat and monitor sensitive species locations and/or populations.

Subsection 3. Emerging Issues: Climate Change

Monitoring Question

Sensitive species monitoring addresses the monitoring question from Chapter 4 of the Forest Plan:

> To what extent is Forest management contributing to the conservation of sensitive species and moving toward short- term (10-20 years) and long-term (100 years) objectives for their habitat conditions?

Another way to look at this question is to ask, "Which sensitive species are most likely to be affected by climate change over the short and long-term?"

Monitoring is driven by the fact that many of the sensitive species on the SNF are at the southern edge of their ranges and may be impacted by climate change as temperatures continue to warm and species of both plants and animals shift northward. Climate change is an emerging issue with new scientific information available (Ruggiero et al. 2008, NABCI 2010, and USDA Forest Service 2010) since revision of the Forest Plan and is reviewed for its risk to current sensitive species populations. The Forest Service has recognized that the nation's forests are at risk due to the effects of climate change (Accessed 10/4/2010 at http://www.fs.fed.us/climatechange/).

The monitoring question, *'To what extent is Forest management contributing to the conservation of sensitive species and moving toward short- term (10-20 years) and long-term (100 years) objectives for their habitat conditions?*' is appropriate for climate change because as vegetation populations shift sensitive species will be impacted. The units of measure are sensitive species and the unit of comparison is vulnerability to climate change.

Methods

The State of the Birds 2010 Report on Climate Change (NABCI 2010), of which the USDA Forest Service was a partner, and the USDA Forest Service Northern Research Station's Climate Change Bird Atlas (Matthews et al. 2007) were reviewed for climate change potential to impact sensitive bird species. Each sensitive bird species was evaluated for vulnerability to climate change using this atlas. Similar atlases were not available for non-avian species, so only birds are discussed.

Results

The 2010 State of the Birds Report (NABCI 2010) lists three-toed woodpecker, olive-sided flycatcher, bay-breasted warbler, and Connecticut warbler at medium vulnerability (scores of 2 out of a high of 4 or more) to climate change in boreal forest habitat. Habitat loss is the major factor affecting populations of all these birds. Bay-breasted warbler and olive-sided flycatcher are both on conservation concern lists within the report. An excerpt from the report follows:

Subtle Changes for Forest Birds
Forests will gradually change as precipitation changes, and as fire, insect pests, and diseases

alter forest communities. Forest types in eastern states are predicted to shift northward, whereas western forest types will shift to higher elevations. These changes will alter bird communities, although most forest birds will probably be resilient because of their large distributions and high reproductive rate. However, long-distance migrants, especially aerial insect-eaters such as swifts and nightjars, may face multiple challenges such as the timing of food resource availability throughout their migratory range. Long-term management solutions should include protecting large forest blocks with the highest carbon stores and connecting landscapes by creating corridors. Overall, the boreal forest is likely to decrease in area, with major changes occurring along the southern boundaries as ranges of tree species shift northward.

Olive-sided flycatchers fit the criteria mentioned above because they are aerial insect eaters, long distance migrants, and at the southern edge of their breeding range on the SNF. Although clearcuts with suitable structure are used for breeding, they do not appear to function as well as in postfire habitat. Increased monitoring would offer the opportunity to protect known nesting locations during management since olive-sided flycatchers appear to have strong nest site fidelity, with some individuals found nesting in the same tree in subsequent years (Altman and Sallabanks 2000).
Bay-breasted warblers are long distance migrants and at the southern edge of their breeding range on the SNF. They are dependent on caterpillars and increase in abundance during spruce budworm outbreaks. They have been found to be vulnerable to collisions with stationary objects such as towers during fall migration. Retention of mature spruce-fir forests will be important to provide food during spruce budworm outbreaks (Williams 1996). Gypsy moths may add to the available Lepidopteran food sources.

Connecticut warblers are at the southern edge of their boreal forest breeding habitat on the SNF and winter in northern South America. It nests on the ground in boreal bogs and jack pine stands that include an ericaceous shrub layer up to three feet high. They have been found to be vulnerable to collisions with stationary objects such as towers during fall migration and breeding habitat may be affected by power lines. The Connecticut warbler is one of the least known species in North America and the highest priority for further research is its general biology on its breeding ground (Pitocchelli et al. 1997).

American three-toed woodpeckers are at the southern edge of their boreal forest, year-round habitat on the SNF. On the SNF they generally inhabit larger patches of recently burned or decadent old growth coniferous (primarily spruce) stands with abundant insect-infected dead and dying trees. Impacts from salvage logging of burned trees, short rotation conifer harvests, and fire suppression are difficult to determine because baseline demographic studies across different habitat types are very limited (Leonard 2001).

Implications

The Forest Service's Climate Change Resource Center (Ruggiero 2008) poses two questions for wildlife which are pertinent to the monitoring of sensitive species:

Crucial Questions
What are the likely specific ecological effects of climate change on wildlife and fish? Answering this question requires detailed information on the biology of affected organisms,

their habitat relations, and determining their bioclimatic tolerances. This information will allow efficient application of scarce resources associated with mitigation.

How do topography and vegetative land cover types affect wildlife dispersal? Planning for dispersal will be increasingly important because it can limit the need for expensive mitigation such as population augmentation or reintroductions.

Recommendations

1. These are questions that will need to be evaluated in species' risk evaluations and mitigations applied vegetation management planning. Vulnerability to climate change should be evaluated for each non-avian species as research becomes available.

2. Increase monitoring on olive-sided flycatcher, bay-breasted warbler, Connecticut warblers, and American three-toed woodpeckers, which show the highest vulnerability to climate change of current sensitive species. This will aid in making informed decisions about management options to meet long-term (100 years) objectives for their habitat conditions.

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